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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HENRY SAMUELI, ET AL. Serial No.: To be assigned Filed: January 20, 1998 For: SYSTEM FOR, AND METHOD OF, PROCESSING QUADRATURE AMPLITUDE MODULATED SIGNALS	Date: January 20, 1998 (#93139) Prior Group Art Unit: 2614 Prior Examining Attorney: D. Vo Docket No.: BRCOM-46674

PRELIMINARY AMENDMENT

BOX CPA
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

The above-captioned application is a divisional under 37 C.F.R. § 1.53(b) of U.S. Serial No. 08/285,504; filed August 3, 1994. Please amend the above-captioned application as follows:

IN THE CLAIMS:

Please delete claim 1.

Please add the following new claims:

75. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data and distortions in the co-axial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship to the other of the digital signals in the pair,

third means for derogating the digital signals in the pair,

fourth means for equalizing the derogated digital signals from the third means, and

fifth means responsive to the derogated digital signals from the third means and the equalized digital signals from the fourth means for providing for the recovery in the digital form of the quadrature amplitude modulated data in the cable.

76. In a combination as set forth in claim 75,

the fifth means including sixth means responsive to the derogated digital signals from the third means and the equalized signals from the fourth means for providing a servo feedback to the second means to adjust the phases of the digital signals from the second means for facilitating the recovery in digital form of the quadrature amplitude modulated data in the co-axial cable.

77. In a combination as set forth in claim 75,

the quadrature amplitude modulated signals in the cable having a particular baud rate,

the first means being operative to produce the digital signals at a rate related to the particular baud rate, and

sixth means responsive to the derogated digital signals from the third means and the equalized digital signals from the fourth means for maintaining the production of the digital signals at the baud rate related to the particular baud rate.

78. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for locking the phases of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable, and

fifth means for providing approximations in the amplitudes of the digital signals in the pair to obtain a selection of an individual one of a plurality of signals having binary values closest to the approximation in the amplitudes of the digital signals in the pair.

79. In a combination as set forth in claim 78,

the quadrature amplitude modulated signals in the cable having a particular baud rate,

the first means being operative to produce the digital signals at a baud rate related to the particular baud rate, and

sixth means responsive to the signals from the third means and the signals from the fifth means for maintaining the production of the digital signals at the rate related to the particular band rate.

80. In a combination as set forth in claim 77,

sixth means responsive to the digital signals from the first means for regulating the gain of the analog signals in the first means.

81. In a combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform the phases of such digital signals to the phases of the quadrature amplitude modulated signals in the co-axial cable,

the third means including fourth means for derogating the phases of the digital signals in the pair and including fifth means for providing a feed forward equalization of the derogated digital signals in the pair and including sixth means for providing a decision feedback equalization of the signals from the fifth means and including a pair of slicers each operable on an individual one of the digital signals from the fourth means and an individual one of the digital signals from the fifth means to slice the digital signals into the closest of a number of progressive binary values.

82. In a combination as recited in claim 81,

the analog signals in the co-axial cable being provided at a variable carrier frequency,

seventh means responsive to the analog signals at the variable carrier frequency for producing analog signals at an intermediate frequency,

the first means being operative on the analog signals at the intermediate frequency to convert such analog signals to the digital signals,

the third means including a servo responsive to the derogated digital signals from the fourth means and the digital signals from the slicers for maintaining the intermediate frequency signals at a particular frequency regardless of the variations in the frequency of the carrier signals.

83. In a combination as set forth in claim 80,

the analog signals in the co-axial cable being provided at a particular baud rate,

the third means including a servo responsive to the derogated digital signals from the

third means and the digital signals from the slicers for providing for the production of the digital signals at a rate related to the particular baud rate.

84. In a combination as set forth in claim 80,

the third means including a servo responsive to the derogated digital signals from the third means and the digital signals from the slicers for maintaining a particular phase relationship between the quadrature amplitude modulated signals in the co-axial cable and the derogated digital signals from the fourth means.

85. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data at a particular baud rate to recover the quadrature amplitude modulated signals from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals at a variable rate,

second means for operating upon the digital signals to provide a pai5r of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for providing a first closed loop serve with the third means to obtain an adjustment in the operation of the first means to a rate having a particular relationship to the particular baud rate, and

fifth means including a feed forward equalizer and a decision feedback equalizer operative in a close loop for providing an equalization in the digital signals in the pair from the third means.

86. In a combination as set forth in claim 85,

sixth means responsive to the signals from the third means for providing a second closed loop servo with the third means for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable.

87. In a combination as set forth in claim 85 wherein

the feed forward equalizer is a first feed forward equalizer and the decision feedback equalizer is a first decision feedback equalizer and

wherein the fifth means includes a second feed forward equalizer and a second decision feedback equalizer and wherein

the first and second feed forward equalizers and the first and second decision feedback equalizers are connected to a symmetrical relationship in the closed loop for providing an equalization in the digital signals in the pair from the second means.

88. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair;

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for providing a closed loop servo with the third means for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable, and

fifth means including a feed forward equalizer and a decision feedback equalizer, the fifth means being operative in a closed loop for providing an equalization in the digital signals in the pair from the second means.

89. In a combination as set forth in claim 88 wherein,

the feed forward equalizer is a first feed forward equalizer and the decision feedback equalizer is a first decision feedback equalizer and wherein the fifth means includes a second feed forward equalizer and a second decision feedback equalizer and wherein the first and second feed equalizers are connected in a symmetrical relationship in the closed loop for providing an equalization in the digital signals in the pair from the third means.

90. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data at a particular baud rate to recover the quadrature amplitude modulated from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals at a variable rate,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for providing a first closed loop servo with the third means for adjusting the operation of the first means to a rate having a particular relationship to the particular baud rate, and

fifth means responsive to the signals from the third means for providing a second closed loop servo with the third means for looking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable.

91. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals in the co-axial cable to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated data in the co-axial lines,

the third means including a decorator and a feed forward equalizer and a decision feedback equalizer and means for combining the outputs of the feed forward equalizer and the decision feedback equalizer to obtain resultant outputs and including means for slicing the resultant outputs to obtain the quadrature amplitude data free from the noise and distortion in the co-axial cable, and

fourth means responsive to the outputs of the decorator and the slicing means for providing for the production of the digital signals at a particular baud rate.

92. In a combination as set forth in claim 91,

the quadrature amplitude modulated signals in the co-axial cable having the particular baud rate,

the analog signals being provided at a variable carrier frequency,

an oscillator for providing signals having a variable frequency, and

means responsive to the outputs of the decorator and the slicing means for varying the frequency of the oscillator to provide, upon a mixing of the signals at the variable carrier frequency and the oscillator signals, intermediate frequency signals having a particular frequency,

the first means being responsive to the intermediate frequency signals at the particular frequency to produce the digital signals,

93. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated data in the co-axial line,

the third means including a decorator and a feed forward equalizer and a decision feedback equalizer and means for combining the outputs of the feed forward equalizer and the decision feedback equalizer to obtain resultant outputs and including means for slicing the resultant outputs to obtain the quadrature amplitude modulated data free from the noise and distortion in the co-axial cable,

the quadrature amplitude modulated signals in the co-axial cable having a variable frequency,

an oscillator having a variable frequency, and

means responsive to the outputs of the decorator and the slicing means for varying the frequency of the oscillator signals to provide, upon a mixing of the signals at the variable

frequency and the oscillator signals, intermediate frequency signals having a particular frequency,

the first means being responsive to the intermediate frequency signals at the particular frequency to produce the digital signals.

94. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

the third means including fourth means for derogating the phases of the digital signals in the pair and including fifth means for providing a feed forward equalization of the derogated signals in the pair and including sixth means for providing a decision feedback equalization of the signals from the fifth means and including seventh means for adding the signals from the fifth means and the sixth means to provide resultant signals and including eighth means responsive to the resultant signals for slicing the resultant signals to provide quadrature amplitude modulated signals conforming to the phases of the quadrature amplitude modulated signals in the co-axial cable and free from the noise and distortion in the co-axial cable.

95. In a combination as set forth in claim 94,

means for providing an automatic gain control of the digital signals from the second means.

REMARKS

This preliminary amendment is being filed concurrently with a continuation application under 37 C.F.R. § 1.53(b). The original parent application contained claims 2-74. In the transmittal for this continuation application, claims 2-74 were canceled without prejudice. This preliminary amendment cancels original claim 1. In addition, this preliminary amendment adds new claims 75-94 for consideration.

With respect to the new claims filed, claims 75-94 have been added to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Pursuant to 35 U.S.C. § 132, no new matter is believed to be introduced by this amendment and all claims are supported by the original disclosure.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Date: August 19, 1998 (#93139/v.2)
HENRY SAMUELI, ET AL.	Prior Group Art Unit: 2614
Serial No.: To be assigned	Prior Examining Attorney: D. Vo
Filed: January 20, 1998	Docket No.: BRCOM-46674
For: SYSTEM FOR, AND METHOD OF, PROCESSING QUADRATURE AMPLITUDE MODULATED SIGNALS	Los Angeles, California 90024

SECOND PRELIMINARY AMENDMENT

BOX CPA
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

The above-captioned application is a [divisional] continuation under 37 C.F.R. § 1.53[(b)] of U.S. Serial No. 08/285,504; filed August 3, 1994. Please amend the above-captioned application as follows:

IN THE CLAIMS:

Claim 75 (amended): [75] 82. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data and distortions in the co-axial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship to the other of the digital signals in the pair,

third means for [derogating] derotating the digital signals in the pair,

fourth means for equalizing the [derogated] derotated digital signals from the third means, and

fifth means responsive to the [derogated] derotated digital signals from the third means and the equalized digital signals from the fourth means for providing for the recovery in the digital form of the quadrature amplitude modulated data in the cable.

Claim 76 (amended): [76] 83. In a combination as set forth in claim [75] 82,

the fifth means including sixth means responsive to the [derogated] derotated digital signals from the third means and the equalized signals from the fourth means for providing a servo feedback to the second means to adjust the phases of the digital signals from the second means for facilitating the recovery in digital form of the quadrature amplitude modulated data in the co-axial cable.

Claim 77 (amended): [77] 84. In a combination as set forth in claim [75] 82,

the quadrature amplitude modulated signals in the cable having a particular baud rate,

the first means being operative to produce the digital signals at a rate related to the particular baud rate, and

sixth means responsive to the [derogated] <u>derotated</u> digital signals from the third means and the equalized digital signals from the fourth means for maintaining the production of the digital signals at the baud rate related to the particular baud rate.

Claim 78 (amended): [78] <u>85</u>. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for locking the phases of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable, and

fifth means for providing approximations in the amplitudes of the digital signals in the pair to obtain a selection of an individual one of a plurality of signals having binary values closest to the approximation in the amplitudes of the digital signals in the pair.

Claim 79 (amended): [79] 86. In a combination as set forth in claim [78] 85,

the quadrature amplitude modulated signals in the cable having a particular baud rate,

the first means being operative to produce the digital signals at a baud rate related to the particular [band] baud rate, and

sixth means responsive to the signals from the third means and the signals from the fifth means for maintaining the production of the digital signals at the rate related to the particular baud rate.

Claim 80 (amended): [80] 87. In a combination as set forth in claim [77] 85,

sixth means responsive to the digital signals from the first means for regulating the gain of the analog signals in the first means.

Claim 81 (amended): [81] 88. In a combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform the phases of such digital signals to the phases of the quadrature amplitude modulated signals in the co-axial cable,

the third means including fourth means for [derogating] derotating the phases of the digital signals in the pair and including fifth means for providing a feed forward equalization of the [derogated] derotated digital signals in the pair and including sixth means for providing a decision feedback equalization of the signals from the fifth means and including a pair of slicers each operable on an individual one of the digital signals from the fourth means and an individual one of the digital signals from the fifth means to slice the digital signals into the closest of a number of [progressive] binary values.

Claim 82 (amended): [82] 89. In a combination as recited in claim [81] 88,

the analog signals in the co-axial cable being provided at a variable carrier frequency,

seventh means responsive to the analog signals at the variable carrier frequency for producing analog signals at an intermediate frequency,

the first means being operative on the analog signals at the intermediate frequency to convert such analog signals to the digital signals,

the third means including a servo responsive to the [derogated] derotated digital signals from the fourth means and the digital signals from the slicers for maintaining the intermediate frequency signals at a particular frequency regardless of the variations in the frequency of the carrier signals.

Claim 83 (amended): [83] <u>90</u>. In a combination as set forth in claim [80] <u>88</u>,

the analog signals in the co-axial cable being provided at a particular baud rate,

the third means including a servo responsive to the [derogated] <u>derotated</u> digital signals from the third means and the digital signals from the slicers for providing for the production of the digital signals at a rate related to the particular baud rate.

Claim 84 (amended): [84] <u>91</u>. In a combination as set forth in claim [80] <u>87</u>,

the third means including a servo responsive to the [derogated] <u>derotated</u> digital signals from the third means and the digital signals from the slicers for maintaining a particular phase relationship between the quadrature amplitude modulated signals in the co-axial cable and the [derogated] <u>derotated</u> digital signals from the fourth means.

Claim 85 (amended): [85] <u>92</u>. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data at a particular baud rate to recover the quadrature amplitude modulated signals from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals at a variable rate,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for providing a first closed loop [serve] servo with the third means to obtain an adjustment in the operation of the first means to a rate having a particular relationship to the particular baud rate, and

fifth means including a feed forward equalizer and a decision feedback equalizer operative in a [close] closed loop for providing an equalization in the digital signals in the pair from the third means.

Claim 86 (amended): [86] 93. In a combination as set forth in claim [85] 92,

sixth means responsive to the signals from the third means for providing a second closed loop servo with the third means for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable.

Claim 87 (amended): [87] 94. In a combination as set forth in claim [85] 92 wherein

the feed forward equalizer is a first feed forward equalizer and the decision feedback equalizer is a first decision feedback equalizer and

wherein the fifth means includes a second feed forward equalizer and a second decision feedback equalizer and wherein

the first and second feed forward equalizers and the first and second decision feedback equalizers are connected [to] in a symmetrical relationship in the closed loop for providing an equalization in the digital signals in the pair from the second means.

Claim 88 (amended): [88] 95. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair;

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for providing a closed loop servo with the third means for locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable, and

fifth means including a feed forward equalizer and a decision feedback equalizer, the fifth means being operative in a closed loop for providing an equalization in the digital signals in the pair from the second means.

Claim 89 (amended): [89] 96. In a combination as set forth in claim [88] 95 wherein,

the feed forward equalizer is a first feed forward equalizer and the decision feedback equalizer is a first decision feedback equalizer and wherein the fifth means includes a second feed forward equalizer and a second decision feedback equalizer and wherein the first and second feed forward equalizers and the first and second decision feedback equalizer, are connected in a symmetrical relationship in the closed loop for providing an equalization in the digital signals in the pair from the third means.

Claim 90 (amended): [90] 97. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data at a particular baud rate to recover the quadrature amplitude modulated from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals at a variable rate,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for providing a first closed loop servo with the third means for adjusting the operation of the first means to a rate having a particular relationship to the particular baud rate, and

fifth means responsive to the signals from the third means for providing a second closed loop servo with the third means for [looking] locking the phases of the pair of the digital signals from the third means to the phases of the quadrature amplitude modulated signals in the co-axial cable.

Claim 91 (amended): [91] 98. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals in the co-axial cable to corresponding digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated data in the co-axial lines,

the third means including a [decorator] derotator and a feed forward equalizer and a decision feedback equalizer and means for combining the outputs of the feed forward equalizer and the decision feedback equalizer to obtain resultant outputs and including means for slicing the resultant outputs to obtain the quadrature amplitude data free from the noise and distortion in the co-axial cable, and

fourth means responsive to the outputs of the [decorator] derotator and the slicing means for providing for the production of the digital signals at a particular baud rate.

Claim 92 (amended): [92] 99. In a combination as set forth in claim [91] 98,

[the quadrature amplitude modulated signals in the co-axial cable having the particular baud rate,]

the analog signals being provided at a variable carrier frequency,

an oscillator for providing signals having a variable frequency, and

means responsive to the outputs of the [decorator] derotator and the slicing means for varying the frequency of the oscillator to provide, upon a mixing of the signals at the variable carrier frequency and the oscillator signals, intermediate frequency signals having a particular frequency,

the first means being responsive to the intermediate frequency signals at the particular frequency to produce the digital signals.

Claim 93 (amended): [93] 100. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated data in the co-axial line,

the third means including a [decorator] derotator and a feed forward equalizer and a decision feedback equalizer and means for combining the outputs of the feed forward equalizer and the decision feedback equalizer to obtain resultant outputs and including means for slicing the resultant outputs to obtain the quadrature amplitude modulated data free from the noise and distortion in the co-axial cable,

the quadrature amplitude modulated signals in the co-axial cable having a variable frequency,

an oscillator having a variable frequency, and

means responsive to the outputs of the [decorator] derotator and the slicing means for varying the frequency of the oscillator signals to provide, upon a mixing of the signals at the variable frequency and the oscillator signals, intermediate frequency signals having a particular frequency,

the first means being responsive to the intermediate frequency signals at the particular frequency to produce the digital signals.

Claim 94 (amended): [94] <u>101</u>. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortion in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable,

the third means including fourth means for [derogating] <u>derotating</u> the phases of the digital signals in the pair and including fifth means for providing a feed forward equalization of the [derogated] derotated signals in the pair and including sixth means for providing a decision feedback equalization of the signals from the fifth means and including seventh means for adding the signals from the fifth means and the sixth means to provide resultant signals and including eighth means responsive to the resultant signals for slicing the resultant signals to provide quadrature amplitude modulated signals conforming to the phases of the quadrature amplitude modulated signals in the co-axial cable and free from the noise and distortion in the co-axial cable.

PLEASE ADD THE FOLLOWING NEW CLAIMS:

102. A method of operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated date from noise and distortions in the co-axial cable, including the steps of:

converting the analog signals to digital signals,

operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature relationship to the other digital signal in the pair,

adjusting the phases of the digital signals in the pair to conform these phases to the phases of the quadrature amplitude modulated signals in the cable,

the analog signals having a gain,

using the digital signals with the conformed phases to adjust the gain of the analog signals to a particular value.

103. A method as set forth in claim 102, including the step of:

the quadrature amplitude modulated signals in the cable having a particular baud rate, and

using the digital signals with the conformed phases to adjust the baud rate of the digital signals so that the baud rate of the digital signals is at the particular rate.

104. A method as set forth in claim 102, including the steps of:

converting the analog signals to analog signals at an intermediate frequency before the conversion of the analog signals to the digital signals, and

using the digital signals with the conformed phases to regulate the intermediate frequency of the analog signals at the particular value.

105. A method as set forth in claim 102 wherein

the step of adjusting the phases of the digital signals in the pair include the step of providing a feed forward equalizer and a decision feedback equalizer and the step of introducing the digital signals in the pair to the feed forward equalizer and of providing an output from the feed forward equalizer to the decision feedback equalizer and of feeding the output from the decision feedback equalizer back to the feed forward equalizer.

106. In a combination as set forth in claim 105,

the quadrature amplitude modulated signals in the cable having a particular baud rate, and

using the digital signals with the conformed phases to adjust the baud rate of the digital signals so that the baud rate of the digital signals is at the particular rate,

converting the analog signals to analog signals at an intermediate frequency before the conversion of the analog signals to the digital signals, and

using the digital signals with the conformed phases to regulate the intermediate frequency of the analog signals at the particular value.

107. A method of operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable, including the steps of:

converting the analog signals to digital signals,

operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature relationship to the other digital signal in the pair,

adjusting the phases of the digital signals in the pair to conform these phases to the phases of the quadrature amplitude modulated signals in the cable,

the quadrature amplitude modulated signals in the cable having a particular baud rate, and

adjusting the baud rate of the digital signals in the pair in accordance with the conformed phases of the digital signals in the pair to have the baud rate of the digital signals correspond to the baud rate of the quadrature amplitude modulated signals in the cable.

108. A method as set forth in claim 107, including the steps of:

converting the analog signals to analog signals at an intermediate frequency before the conversion of the analog signals to digital signals, and

using the digital signals with the conformed phases to regulate the intermediate frequency of the analog signals at a particular value.

109. A method as set forth in claim 106 wherein the step of adjusting the phases of the digital signals includes the step of providing a pair of feed forward equalizers and a pair of decision feedback equalizers in a symmetrical relationship.

110. A method as set forth in claim 107 wherein a pair of feed forward equalizers and a pair of decision feedback equalizers and a pair of slicers are provided to adjust the phases of the digital signals in the pair to conform the digital signals in the pair to the phases of the quadrature amplitude modulated signals and wherein one of the feed forward equalizers, one of the decision feedback equalizers and one of the slicers is operative on one of the digital signals in the pair and the other of the feed forward equalizers, the other of the decision feedback equalizers and the other of the slicers is operative on the other of the digital signals in the pair.

111. A method of operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable, including the steps of:

converting the analog signals to analog signals at a particular intermediate frequency,

converting the analog signals at the particular intermediate frequency to digital signals,

operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature relationship to the other digital signal in the pair,

adjusting the phases of the digital signals in the pair to conform these phases to the phases of the quadrature amplitude modulated signals in the cable, and

using the digital signals with the conformed phases to maintain the intermediate frequency at the particular value.

112. A method as set forth in claim 111, including the steps of:

providing feed forward equalizers and decision feedback equalizers,

introducing the digital signals in the pair to the feed forward equalizers and the decision feedback equalizers and combining the outputs of the feed forward equalizers and the decision feedback equalizers to produce resultant signals,

slicing the resultant signals to obtain the quadrature amplitude data free from noise and distortions.

113. A method of operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable, including the steps of:

converting the analog signals to digital signals,

operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature relationship to the other digital signal in the pair,

adjusting the phases of the digital signals in the pair to conform these phases to the phases of the quadrature amplitude modulated signals in the cable, and

introducing the phase-adjusted digital signals to feed forward equalizers and decision feedback equalizers and slicers, each operative on an individual one of the digital signals in the pair, to obtain a slicing of the digital signals into the closest of a number of binary values.

114. A method as set forth in claim 113 wherein

the feed forward equalizers and the decision feedback equalizers provide a symmetrical operation on the digital signals in the pair to obtain the slicing of the digital signals into the closest of the number of the binary values.

115. A method of operating upon analog signals transmitted through a co-axial cable providing quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable, including the steps of:

converting the analog signals to digital signals at a particular rate,

multiplying the digital signals with trigonometric signals to provide the digital signals with a quadrature phase relationship,

derotating the digital signals with the quadrature phase relationship,

operating upon the derotated digital signals to recover the amplitude modulated data from the noise and distortions in the co-axial cable,

operating upon the derotated digital signals and the recovered amplitude modulated data to produce error signals, and

adjusting the rate of the conversion of the analog signals to the digital signals in response to the error signals to regulate the conversion of the analog signals to the digital signals at the particular rate.

116. A method as set forth in claim 115, including the step of:

adjusting the gain of the analog signals, before the conversion of the analog signals to the digital signals, in response to the error signals to regulate the gain of the analog signals at a particular value.

117. A method as set forth in claim 115, including the step of:

converting the frequency of the analog signals to an intermediate value before the conversion of the analog signals to digital signals, and

adjusting the value of the intermediate frequency in response to the error signals to regulate the intermediate frequency at a particular value.

118. In combination for operating upon analog signals transmitted through a co-axial cable providing quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide the digital signals with a quadrature phase relationship,

third means for derotating the digital signals passed by the second means,

fourth means responsive to the derotated digital signals for recovering, in digital form, the quadrature amplitude modulated data,

the third means including fifth means for multiplying the output from the first means by trigonometric signals in a quadrature phase relationship to provide for a recovery in digital form of the quadrature amplitude modulated data from the noise and distortions in the co-axial cable,

sixth means responsive to the derotated digital signals for producing error signals, and

seventh means responsive to the error signals from the sixth means for regulating the rate at which the first means converts the analog signals to the digital signals.

119. In a combination as set forth in claim 118 wherein

eighth means are responsive to the error signals from the sixth means for regulating the gain of the analog signals before the conversion of the analog signals to the digital signals.

120. In a combination as set forth in claim 118, including,

eighth means for converting the analog signals to analog signals at an intermediate frequency before the conversion of the analog signals to the digital signals, and

ninth means responsive to the error signals from the sixth means for regulating the analog signals at the intermediate frequency to maintain the intermediate frequency at a particular value.

121. In a combination as set forth in claim 118, including,

the analog signals having amplitude modulations,

the fourth means including equalizers and slicers responsive to the derotated digital signals for slicing the derotated digital signals to provide amplitudes indicating the data represented by the amplitude modulations.

122. In a combination as set forth in claim 118, including,

the fourth means including feed forward equalizers and decision feedback equalizers and slicers each operative on an individual one of the digital signals in the pair to obtain a slicing of the digital signals into the closest of a number of binary values.

123. In combination for operating upon analog signals transmitted through a co-axial cable providing quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide the digital signals with a quadrature phase relationship,

third means for derotating the digital signals from the second means,

fourth means responsive to the derotated digital signals for recovering, in digital form, the quadrature amplitude modulated data,

the second means including fifth means for multiplying the output from the first means by trigonometric signals in a quadrature phase relationship to provide for the recovery in digital form by the fourth means of the quadrature amplitude modulated data from the noise and distortions in the co-axial cable,

sixth means responsive to the derotated digital signals and the recovery in digital form of the quadrature amplitude modulated data for producing error signals, and

seventh means responsive to the error signals from the sixth means for regulating the gain of the amplitude modulated signals before the conversion of the analog signals to the digital signals.

124. In a combination as set forth in claim 123,

eighth means responsive to the error signals from the sixth means for regulating the rate of conversion of the analog signals to the digital signals to maintain the rate of conversion at a particular value.

125. In a combination as set forth in claim 123,

eighth means for converting the analog signals to an intermediate frequency before the conversion of the analog signals to the digital signals, and

ninth means responsive to the error signals for operating upon the eighth means to regulate the analog signals at the intermediate frequency to maintain the intermediate frequency at a particular value.

126. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude modulated data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform these phases to the phases of the quadrature amplitude modulated signals in the co-axial cable,

fourth means responsive to the signals from the third means for locking the phases of the digital signals from the third means to the phases of the digital signals from the quadrature amplitude modulated signals in the co-axial cable,

the third means including feed forward equalizers and decision feedback equalizers connected to the feed forward equalizers in a symmetrical relationship, the feed forward equalizers and the decision feedback equalizers being responsive to the phases of the digital signals in the pair to adjust the phases of the digital signals in the pair to conform these phases to the phases of the quadrature amplitude modulated signals in the co-axial cable.

127. In combination for operating upon analog signals transmitted through a co-axial cable using quadrature amplitude data to recover the quadrature amplitude modulated data from noise and distortions in the co-axial cable,

first means for converting the analog signals to digital signals,

second means for operating upon the digital signals to provide a pair of the digital signals, one of the digital signals in the pair having a quadrature phase relationship with the other of the digital signals in the pair,

third means for adjusting the phases of the digital signals in the pair to conform to the phases of the quadrature amplitude modulated signals in the co-axial cable, and

fourth means responsive to the signals from the third means for locking the phases of the digital signals from the third means to the phases of the digital signals from the quadrature modulated signals in the co-axial cable,

the third means including feed forward equalizers connected to the second means and decision feedback equalizers connected to the feed forward equalizers in a feedback relationship with the feed forward equalizers.

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REMARKS

This second preliminary amendment is being submitted to accomplish the following:

1. To confirm that this is a continued prosecution application.

2. To renumber claims 75-94 as claims 82-101, respectively.

3. To amend claims 82-101 to correct informalities noted by applicants' attorney in claims 82-101 upon a further study of the claims.

4. To add claims 102-127 in this second preliminary amendment.

Reconsideration and allowance of the application are respectfully requested.

Respectfully submitted,

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